

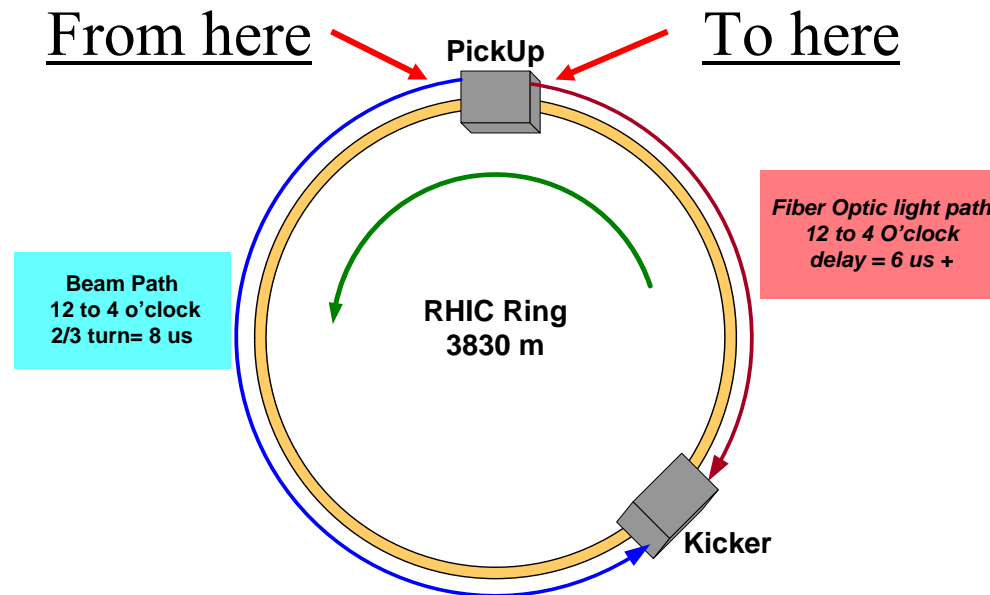
Accelerator Physics Experiments for Stochastic Cooling Development

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APEX 2005 Workshop

1. New hardware for 2006
2. Dedicated time for set up
3. Possibility to test cooling with protons
4. Accelerator experiment using S.C. gear

New Hardware

- Pickup moved from Q4 @ 11 to Q4 @ 12 o'clock (to gain time for signal processing and fill time for kicker cavities)

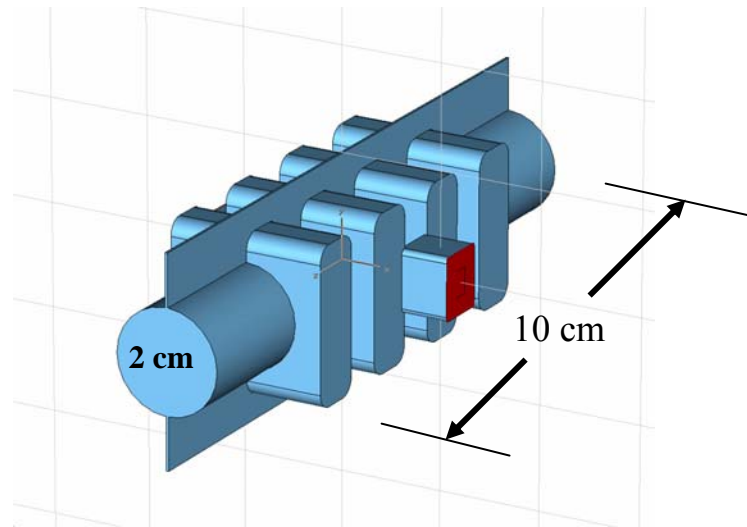


New Hardware

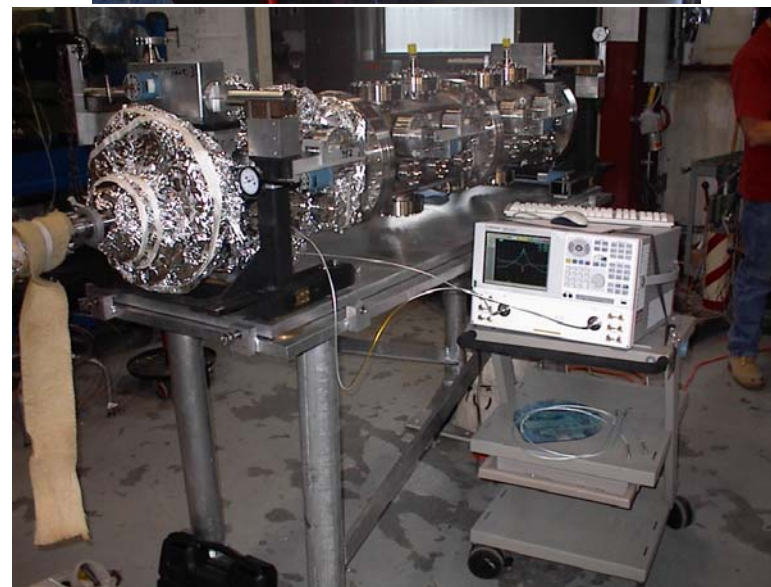
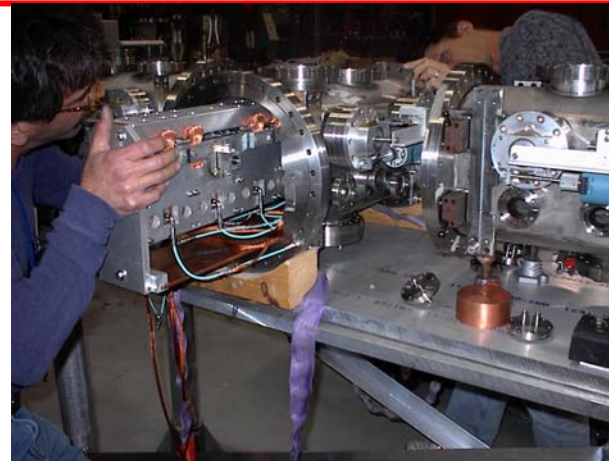
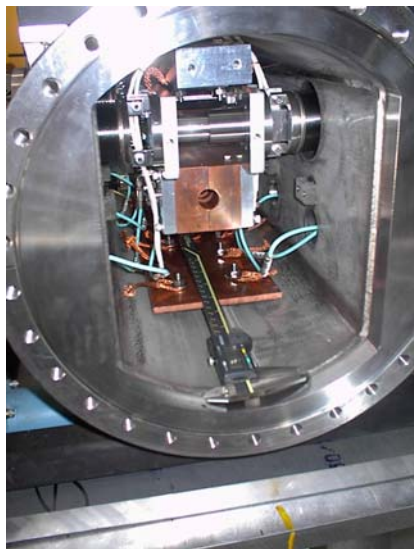
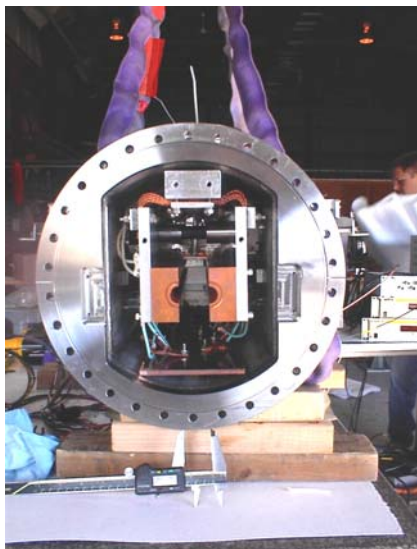
- New and more kicker cavities
 - 16 cavities, from 5.0 to 8.0 GHz
 - Thermally stable for CW operation
 - Enough to cool Gold

**Cavities are designed with CST
MicroWave Studio**

$R/Q = 120 \Omega$, $f = 5.0, 5.2, \dots, 7.8, 8.0 \text{ GHz}$



New Hardware



Dedicated time for Set Up

1. We need about 2 hours at store (once) to check aperture and BPM read out
2. After that we believe (based on last year) that we only need to check orbit via BPM
3. Whenever we close the cavities we watch the lifetime monitor and backgrounds

Low (very) Intensity Bunch/fill to Test Cooling

- We could try to make a low intensity bunch
 - $\sim 10^9$ per bunch, 1% of production bunch
 - The idea (proposed by Tom Hayes) is to fill the first bunch in Yellow then use radial steering to peel intensity
 - Must be first bunch in train (electronic saturation)
 - The technique would require development
 - Where do the losses go? (is a bump better?)
 - Can we even see the low intensity?

Accelerator Physics Experiment to Measure Z_1/n

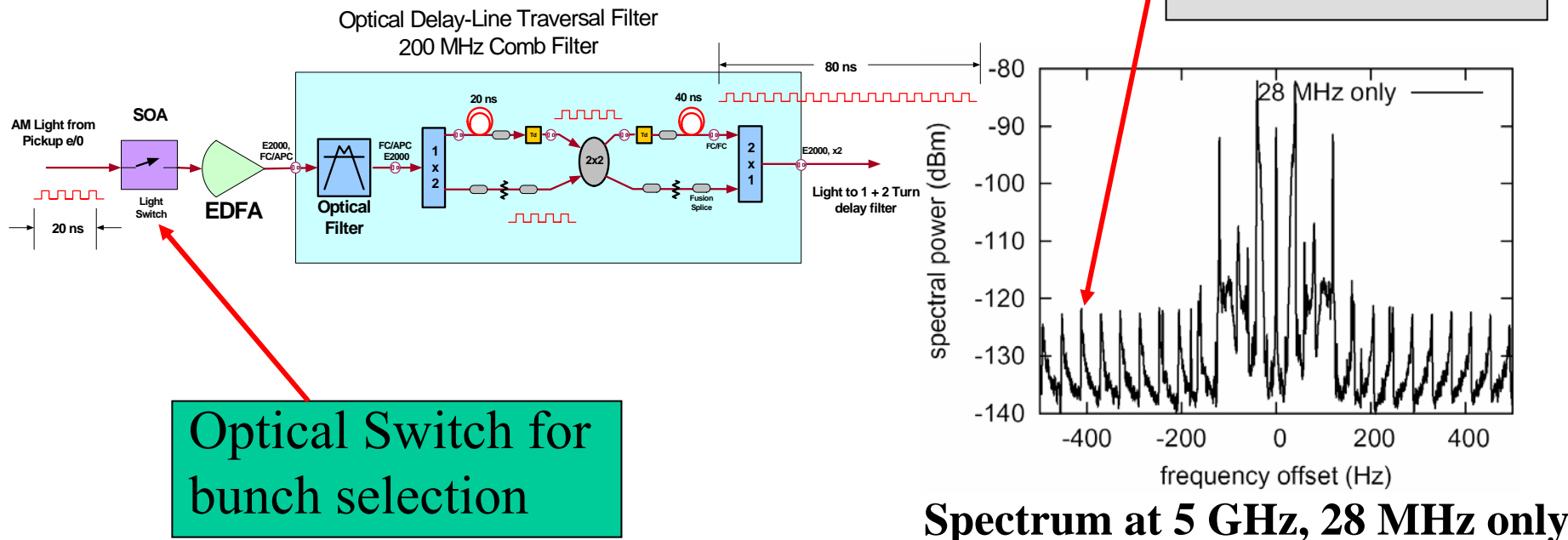
- The idea is to use the stochastic cooling gear to measure synchrotron frequency bunch-by-bunch
- Fill the machine with a range of intensities and deduce the suppression of f_s with intensity
- This was done once before (EPAC2002, Blaskiewicz et al). Why do it again?

Accelerator Physics Experiment to Measure Z_1/n . Why repeat?

1. More data is always a good thing!
2. There is a discrepancy between the previous result and calculations (by x 3)
3. The coupling impedance is an important parameter for the machine going to higher bunch intensity (brightness)
4. New species, proton compared to gold
5. New values of γ
 1. Proton, 25,100,200
 2. Gold, 10 100
6. Higher bunch intensity
 1. Gold $< 7 \times 10^{10}$ charges per bunch
 2. Proton $\sim 1.3 \times 10^{11}$ charges per bunch

Technique for Measuring Z_1/n

- Use the stochastic cooling electronics to measure synchrotron frequency bunch-by-bunch



Technique for Measuring Z_1/n

- Fill the machine with a wide range of bunch intensities
 - The relevant parameter is $N/(l^3)$, where l is bunch length
- Dedicated beam time in Yellow is required
 - One two-to-four hour session at injection for developing the filling technique (and f_s measurements)
 - Normal fill with 28 MHz only at store (test for beam loading effects)
 - Special fill with range of intensities (4 hours at store)
 - Same at 200 GeV